Original text

Contribute a better translation

6. How to use the interface

GPIB (IEEE - 488) interface, USB interface are standard equipment of this instrument. However
It can not be used at the same time. Please select one of them and use it.

6.1 Interface selection

Interface selection and setting can be set only from the menu on the front panel.

1. The selected interface is saved in nonvolatile memory, turn off the power supply and change the interface
   Even if resetting it will not change.
2. Set the device specific address for the interface. Also in the USB interface
   If you connect a device, set the address (USB.ID) to identify each.
   The address is displayed by turning on the power or setting the address in the menu.
   The setting items of the interface and the factory shipping status are shown below.

Setting items	Factory shipment state
GPIB address / USB.ID	1
GPIB talker function	Addressable

Interface selection

MENU Inside **8 I / F** Select the interface to use with 'BUS'.

ENTER Press to confirm.

6.2 GPIB

6.2.1 Overview

When GPIB (General Purpose Interface Bus) is used, setting of various measuring functions of this product, measurement panel Since it is possible to externally control setting of parameters and reading measurement data, automatic measurement system is easy Can be configured.
Since the GPIB signal from this product is electrically isolated from the measuring signal system of the main unit,
There is no influence on the measured value by the connected equipment.

- General specification

  Standard: IEEE-488.2

  Code used: ASCII code

  Logical level: Logic 0 "High" state + 2.4 V or more
  Logic 1 "Low" state +0.4 V or less

Table 6-1 Interface Function

code	function
SH1	Source handshake function
AH1	Acceptor handshake function
T5	Basic talker function, talker release function by listener specification, Talk only mode function, serial / pole function
L4	Basic listener function, listener cancellation function by talker specification
SR1	Service request function
RL 1	Remote / local switching function
PP0	Parallel pole function not available
DC1	Device clear function (SDC, DCL command can be used)
DT 1	Device trigger function (GET command can be used)
C 0	No controller function
E2	Using 3 state bus driver

6.2.2 Precautions on using **GPIB**

1. Connection cables to measuring instruments, bus cables connected to controllers, etc. are required more than necessary Please do not lengthen. Please be careful not to exceed 20 m cable. In addition, our company The following cables are prepared as standard bus cables.

Table 6-2 Standard bus cable

length	name
0.5 m	408JE-1P5
1 m	408JE-101
2 m	408JE-102
4 m	408JE-104

2. The connector of the bus cable is a piggyback type, and one connector has both male and female It can be used repeatedly.

When connecting bus cables, do not use three or more connectors in layers. Up
Please firmly fix with the connector set screw.

3. Check the power condition, grounding status, and setting conditions of each component, if necessary,
   Turn on the equipment power.
   Be sure to turn on all devices connected to the bus. If you turn on the power
   The operation of the whole system can not be guaranteed if there is a device which is not done.

4. Cable attachment / detachment
   Before attaching or detaching the GPIB cable, turn off the power of all connected equipment. Also,
   Please connect / disconnect the case grounds of each connection with each other.

5. ATN interrupt during message transfer
   If an ATN request interrupts during message transfer between devices, prioritize ATN
   The previous state is cleared.

6. When using in talk-only mode, do not connect the controller.

7. Up to 255 characters are recognized for one transfer of program command.
   An error occurs if the program / command exceeds 255 characters.

8. After sending the program command, hold the REN line LOW for 5 ms or more.

9. The * TRG command can accept the next command before the execution is completed.
   To synchronize with completion of command execution, use * OPC, * OPC ?, * WAI command.
   * OPC, * OPC?, * The WAI command must be written at the end of one line of program line.
   An example
   "* TRG, * OPC"
   "* TRG, * OPC?
   "* TRG, * WAI"

6.2.3 Setting up **GPIB**

Address setting

1. **MENU** Inside **8 I / F** In 'GP.Adr' enter an address from 0 to 30.
2. **ENTER** Press to confirm.

Talk only setting

1. **MENU** Inside **8 I / F** 'T.Only' makes the following choices.
   ON: Talk only
   OFF: Address specification
2. **ENTER** Press to confirm.

Output data element setting

1. **MENU** Inside **8 I / F** 'ELEM', select the following output element with I will.
   Output element
   'FUNC': Function
   'COMP': Comparator operation
   '4 W. CHK': 4 W check
   'NULL': NULL setting
   'SM': Smoothing setting
   'MATH': MATH calculation setting
   'MX / MN': MAX / MIN calculation settings
2. **ENTER** Confirmed with,,,
   ON: Output value shown in " 6.5.1 Output data format " in measured value
   Is added.

OFF: Not added.

3. **ENTER** I will confirm with.

6.3 USB

6.3.1 Overview

This instrument is equipped with USB (Universal Serial Bus) compliant with the USB 2.0 standard as standard.
When USB is used, setting of functions and reading of measurement data for a plurality of instruments on the bus,
It becomes possible from a personal computer, and an automatic measurement system can be easily configured.

Caution Operation with all personal computers, hubs, etc. is not guaranteed.

6.3.2 **USB** specification

- standard: USB 2.0 compliant
- Connector used: USB B type (female)
- Identification ID: You can set 1 to 127 as USBid
- Remote / local: equipped
- Input command: Function setting by ASCII string command, query
- Output format: measurement data by ASCII character string, query response output
- driver: ADC instrument USB driver used
  (You can download from our website)

6.3.3 **USB** setup

In order to use the USB interface of this product, we use our company ADC measuring instrument USB driver as a person
You need to install it on your computer.

ADC instrument USB driver can be downloaded free of charge from our website.

URL http://www.adcmt.com/

For the installation method and usage, refer to the instruction manual included in the download file
please.

Please refer to the instruction manual of ADC instrument USB driver for supported OS and corresponding language.

6.3.3.1 Connection with a personal computer

Connect the USB connector (B type) on the back of the unit to the USB connector on the personal computer
Please connect with cable.

When connecting, be sure to insert the connector to the end.

When connecting multiple instruments to a single personal computer, use a USB hub.
.

6.3.3.2 **USBid** settings

The USBid setting menu can be set when the interface selection is USB.

1. **MENU** Inside **8 I / F** Enter the address from 1 to 127 with 'USBID'.
2. **ENTER** Press to confirm.

6.4 Single wire signal

6.4.1 External trigger terminal **(TRIGGER IN)**

A negative logic pulse can be input to the external trigger terminal (TRIGGER IN) on the back panel to trigger the instrument.
.
To use this pin, set the sampling mode to hold.
For the trigger signal, input TTL level or contact signal.

Figure 6-1 Trigger input terminal Simplified equivalent circuit

6.4.2 Measurement end signal terminal **(COMPLETE OUT)**

At the end of the measurement, a negative logic pulse is output to the measurement end signal terminal (COMPLETE OUT) on the back panel .
Multiple output and single output can be selected according to the output timing of the complete signal.

Multi output	Output for each sampling
Single output	Output when the set number of sampling times is completed

MENU Inside **10 SYS** Select 'Single' (SGL) / Multi (MULTI) with 'C.Sig'.
ENTER Press to confirm.

Pulse width can be selected according to the equipment to be connected.

MENU Inside **10 SYS** Please select the following with 'C. Widt'.

100 µs	Pulse width 100 µsec
5 µs	Pulse width 5 µsec

ENTER Press to confirm.

The measurement end signal is directly connected as an input signal of the TTL level and programmable controller
You can continue.

Figure 6-2 Complete output terminal Simplified equivalent circuit

6.4.2 Measurement end signal terminal (COMPLETE OUT)

Complete signal output timing

Indicates the representative value of the output timing of the complete signal in the following setting conditions.

Function: DCV, Auto · Zero: Off, Auto Range: Off

1. In case of single output

   Time Tc from the trigger signal input of the external trigger terminal to the complete signal output

   Tc = Tin × sampling number + 2.5 msec

   Tin: The longest time among the following

   Sampling cycle (SI)

   Integration time (IT) + 30 μsec

   850 μsec: measurement data · memory off

   1.29 msec: display on

2. In case of multi output

   Complete output period Tcp

   Tcp = Tin + 1.4 msec

   Tin: same as above

6.5 Command reference

Here we describe the command reference of this product.

6.5.1 Output data format

Measurement data output format is as follows.

○ ○ ○ ± ddd.dddddE ± dd, ○○○, ○○○, ○○○, ○○○, ○○○, ○○○ △△

Item 1 Item 2 Item 3 Item 4 Item 5 Item 6 Item 7 Item 8 Item 9

1. Section 2: Measurement data
   ± ○ ○ ○ ○. ○○○○ E ± ○○

   Exponent part: "E" + polarity + 2 digit number
   Mantissa part: polar + decimal + 5 to 8 digit number

   The number of output digits of the mantissa changes depending on the setting of range, integration time and number of digits to be displaye

Table 6-3 Measurement data format

function	range	Four-digit semi-digit display half	5 digit display half	Six digits display 7 digit display half	
			1 ms <IT <1 PLC	1PLC ≤ IT ≤ 100 PLC	
DC voltage measurement (DCV)	100 mV	± ddd.ddE-03	± ddd.dddE - 03	± ddd.ddddE - 03	± ddd.ddddE - 03
	1000 mV	± dddd.dE-03	± dddd.ddE-03	± dddd.dddE-03	± dddd.ddddE-03
	10 V	± dd.dddE + 00	± dd.dddddE + 00	± dd.dddddE + 00	± dd.dddddE + 00
	100 V	± ddd.ddE + 00	± ddd.dddE + 00	± ddd.ddddE + 00	± ddd.dddddE + 00
	1000 V	± dddd.dE + 00	± dddd.ddE + 00	± dddd.dddE + 00	± dddd.ddddE + 00
2 wire resistance measurement (2 WΩ) 4 wire resistance measurement (4 WΩ)	10 Ω	± dd.dddE + 00	± dd.dddddE + 00	± dd.dddddE + 00	± dd.dddddE + 00
	100 Ω	± ddd.ddE + 00	± ddd.dddE + 00	± ddd.ddddE + 00	± ddd.dddddE + 00
	1000 Ω	± dddd.dE + 00	± dddd.ddE + 00	± dddd.dddE + 00	± dddd.ddddE + 00
	10 kΩ	± dd.dddE + 03	± dd.dddddE + 03	± dd.dddddE + 03	± dd.dddddE + 03
	100 kΩ	± ddd.ddE + 03	± ddd.dddE + 03	± ddd.ddddE + 03	± ddd.dddddE + 03
	1000 kΩ	± dddd.dE + 03	± dddd.ddE + 03	± dddd.dddE + 03	± dddd.ddddE + 03
	10 MΩ	± dd. DddE + 06	± dd.dddddE + 06	± dd.dddddE + 06	± dd.dddddE + 06

- Special output value
  The following special value is o
  However, the mantissa digits Ta ment data format".

Contents	value
Over range (OL)	± 9.9000000E + 37
When the result of the scaling operation is OVER	
dB / dBm operation error	

2. Item 1, 3 to 8: Output data element
   Elements set to ON in the output data element setting are output. Set to OFF

The specified items are not output.

Output data element

Output item	Output contents	Number of output character characters	
Item 1 Function	DC voltage measurement (DCV)	"DCV"	3 letters
	2 wire resistance measurement (2 WΩ)	"2 WO"	
	4 wire resistance measurement (4 WΩ)	"4 WO"	
Item 3 Comparator operation	PASS	", PAS"	comma
	FAIL	", FAL"	+ 3 letters
	OFF	", OFF"	
Item 4 4W check	No break	",OK "	
	Measurement current HI terminal disconnected	", IHI"	
	Measurement voltage HI terminal disconnected	", VHI"	
	Measured voltage LO terminal disconnected	", VLO"	
	Measured current or measured voltage LO terminal disconnected	", ILO"	
	Function other than OFF or 4 WΩ	", OFF"	
Item 5 Null setting	ON	", NUL"	
	OFF	", OFF"	
Item 6 Smoothing setting	ON	", SMO"	
	OFF	", OFF"	
Item 7 MATH calculation setting	scaling	", SCL"	
	dB	", dB"	
	dBm	", dBm"	
	OFF	", OFF"	
Item 8 MAX / MIN calculation setting	ON	", MXN"	
	MAX	", MAX"	
	MIN	", MIN"	
	OFF	", OFF"	

Output example) When all are output

DCV + 1000.0000 E - 03, PAS, OFF, OFF, SMO, SCL, MAX

3. Section 9: Block delimiter

The end of one data is delimited by a block delimiter.

Table 6-4 Block delimiter

delimiter	Configuration command	initial value
CRLF + EOI	DL 0	●
LF	DL 1	
EOI	DL 2	

6.5.2 **ADC** Command Reference

This chapter describes the ADC command reference of this product.

"Initial value" indicates the status when the * RST command is executed.

item	command	Contents	initial value
Measurement function	F1	DC voltage measurement (DCV)	●
	F3	2 wire resistance measurement (2 WΩ)	
	F4	4 wire resistance measurement (4 WΩ)	
	F?	Response: F01, F03, F04	
Trigger	* TRG	Trigger command	
measurement data memory	ST 0	Store OFF	●
	ST1	Store ON	
	ST?	Response: ST0 or ST1	
	IRDn, m	Read range setting n, m: 0 to 9999 • Parameter can not be omitted	(0, 0)

IRO?	Reading data	Refer to " 6.5.1 Output data format "
IRPO?	Reading the number of data Response: IRPOddddd	
IRNO?	Reading data range Response: IRNOdddd, dddd (When there is no data: IRNO0000, -001)	
ICL	Initialization of measured data and memory	

	item	command	Contents	initial value
Trigger system	start	INI	Leave the IDLE state	
	Continue	INIC 0	CONTINUOUS OFF	
		INIC 1	CONTINUOUS ON	●
		INIC?	Response: INIC 0 or INIC 1	
	Trigger source Choice	TRS 0	IMMEDIATE	●
		TRS 1	MANUAL	
		TRS 2	EXTERNAL	
		TRS 3	BUS	
		TRS?	Response: TRS 0 to TRS 3	
	sampling· interval	TRTn	n: 0.003 to 3600 (sec)	(500 ms)
		TRT?	Response: TRT + d.dddddE ± dd * 1	
	Trigger count	TRNn	n: 1 to 50000 (times)	(1)
		TRN?	Response: TRNddddd	
	Trigger / Abort	ABO	Forcibly shift to IDLE state	
	Trigger delay	TRDn	n: 0 to 3600 (sec)	(0)
		TRD?	Response: TRD + d.ddddE ± dd (The decimal point position depends on the setting value.)	
	Number of sampling (With one trigger)	SPNn	n: 1 to 16000 (times)	(1)
		SPN?	Response: SPNddddd	
	Complete signal Output mode	TRCM 0	SINGLE	●
		TRCM 1	MULTI	
		TRCM?	Response: TRCM 0 or TRCM 1	
	complete Signal width	CW 0	Designation of output signal width of complete signal: 5 µs	●
		CW 1	Designation of output signal width of complete signal: 100 µs	
		CW?	Response: CW 0 to CW 1	

	item	command		Contents		initial value
Measurement condition	Measurement range		DCV	2 WΩ	4 WΩ	
		R 0	AUTO	AUTO	AUTO	●
		R2	-	10 Ω	10 Ω	

R3	100 mV	100 Ω	100 Ω
R4	1000 mV	1000 Ω	1000 Ω
R5	10 V	10 kΩ	10 kΩ
R6	100V	100 kΩ	100 kΩ
R7	1000 V	1000 kΩ	1000 kΩ

6.5.2 ADC Command Reference

item	command	Contents	initial value
Measurement condition	R8	- 10 MΩ	10 MΩ
	R?	Response: R 0, R 2 - R 8	
Range Fix	RX	AUTO → MANUAL range switch	
sampling· rate	PR0	FREE (When sample period or integration time is changed, Respond PR0.)	
	PR1	FAST	
	PR2	MED	
	PR3	SLOW	•
	PR?	Response: PR0 to PR3	
Number of display digits	RE4	4 1/2 digit display	
	RE 5	5 1/2 digit display	
	RE 6	6 1/2 digit display	
	RE 7	7 1/2 digit display	•
	RE?	Response: RE4 to RE7	
Integration time	ITPn	Set the integration time in PLC units (input values are decomposition of integration time It is rounded by Noh). n: 0.05 to 100 (when the power frequency is 50 Hz) n: 0.06 to 100 (when the power frequency is 60 Hz)	(Tsin)
	ITP?	Response: ITP + d.dddddE ± dd	
	ITSn	Set the integration time in seconds (input value is resolution of integration time It is rounded by). n: 0.001 to 2 (when the power frequency is 50 Hz) n: 0.001 to 1.666667 (when the power frequency is 60 Hz)	(Tsin)
	ITS?	Response: ITS + d.ddddE ± dd	
Auto zero	AZ 0	OFF	
	AZ 1	ON	•
	AZ 2	ONCE (It will be auto zero · OFF after execution.)	
	AZ?	Response: AZ 0 or AZ 1	
4 W Ω check	OCHK 0	OFF	•
	OCHK1	ON	
	OCHK?	Response: OCHK 0 or OCHK 1	

item		command	Contents	initial value
Calculation	NULL operation	NL 0	OFF	●
		NL1	ON	
		NL?	Response: NL 0 or NL 1	
		KNLn	Setting of NULL constant -9.9999999E + 12 to + 9.9999999E + 12 Setting resolution: 0.0000001E-9 Caution: Can not be set when NULL operation is OFF	(0)
		KNL?	Response: KNL ± d.ddddddd ± dd * 1	
	Smoothing operation	SM0	OFF	●
		SM1	ON	
		SM?	Response: SM0 or SM1	
		TIn	Number of smoothing n: 2 to 100 (times)	(Ten)
		TI?	Response: TIddd	
	Scaling operation	SC0	OFF	●
		SC1	ON	
		SC?	Response: SC0 or SC1	
		KXn	X constant (0 (zero) can not be set) -9.9999999E + 12 to + 9.9999999E + 12 Setting resolution: 0.0000001E-9	(1)
		KYn	Y constant -9.9999999E + 12 to + 9.9999999E + 12 Setting resolution: 0.0000001E-9	(0)
		KZn	Z constant -9.9999999E + 12 to + 9.9999999E + 12 Setting resolution: 0.0000001E-9	(1)
		KXMD	Set measurement value for X constant	
		KYMD	Set measured value as Y constant	
		KZMD	Set measurement value to Z constant	
		KX?	Response: KX ± d.ddddddd ± dd * 1	
		KY?	Response: KY ± d.ddddddd ± dd	
		KZ?	Response: KZ ± d.ddddddd ± dd	
	dB / dBm calculation	DB 0	dB calculation OFF	●
		DB1	dB calculation ON	
		DB2	dBm calculation ON	
		DB?	Response: DB 0 to DB2	

* 1: The decimal point position of the response is fixed.

item		command	Contents	initial value
Calculation	dB / dBm calculation	KDBn	D constant n: 0.0000001 E-9 to 9.9999999 E + 12	(1)
			Set measurement value to KDBMD D constant	
		KDB?	Response: KDB ± d.ddddddd ± dd * 1	
	MAX · MIN operation	MN 0	MAX · MIN calculation OFF	●
		MN 1	MAX · MIN calculation ON	
		MN?	Response: MN 0 to MN 1	
		MAX?	Reading the MAX value * 1 Response: MAX ± d.ddddddd ± dd	
		MIN?	Loading MIN * 1	

	AVE?	Response: MIN ± d.ddddddE ± dd Reading AVE * 1 Response: AVE ± d.ddddddE ± dd	
	AVN?	Reading the number of measurements * 1 Response: AVN ± d.ddddddE ± dd	
Comparator operation	CO0	OFF	•
	CO1	ON	
	CO?	Response: CO0 or CO1	
	HIn	HIGH constant -9.9999999E + 12 to + 9.9999999E + 12 Setting resolution: 0.0000001E-9	(0)
	LOn	LOW constant -9.9999999E + 12 to + 9.9999999E + 12 Setting resolution: 0.0000001E-9	(0)
	HIM	Set measured value to HIGH constant	
	LOM	Set measured value to LOW constant	
	HI?	Response: HI ± d.ddddddE ± dd * 1	
	LO?	Response: LO ± d.ddddddE ± dd * 1	
Pass condition range setting	LOP 0	Do not set LO of operation result as path condition	•
	LOP 1	LO of the calculation result is set as a path condition	
	LOP?	Response: LOP 0 or LOP 1	
	MIP 0	Do not set GO of calculation result as path condition	
	MIP 1	The GO of the calculation result is set as a path condition	•
	MIP?	Response: MIP 0 or MIP 1	

* 1: The decimal point position of the response is fixed.

item	command	Contents	initial value
Calculation Pass condition range setting	HIP 0	Do not set HI of calculation result as path condition	•
	HIP 1	The HI of the operation result is set as a path condition	
	HIP?	Response: HIP 0 or HIP 1	
Statistical calculation	SIRDn, m	Range setting and execution of statistical calculation n, m: 0 to 9999 Caution 1. Measurement data · Data exists in the set range of memory If not, it will result in an error 2. Parameters can not be omitted	(0, -1)
	SIRD?	Read statistical calculation range Response: SIRDdddd, dddd (Initial state: SIRD + 0000, -0001)	
		Read statistical calculation result	
	SCNT?	Reading the number of samples Response: SCNT + d.ddddddE ± dd * 1	
	SMAX?	Maximum value reading Response: SMAX ± d.ddddddE ± dd * 1	
	SMIN?	Reading the minimum value Response: SMIN ± d.ddddddE ± dd * 1	
	SAVE?	Read average value Response: SAVE ± d.ddddddE ± dd * 1	
	SSIG?	Read standard deviation value Response: SSIG + d.ddddddE ± dd * 1	
	SPTP?	MAX-MIN reading Response: SPTP ± d.ddddddE ± dd * 1	

* 1: The decimal point position of the response is fixed.

	item	command	Contents	initial value
system	buzzer	BP 0	OFF	●
		BP1	Buzzer sounds when comparator operation result is FAIL	
		BP 2	Buzzer sounds when comparator operation result is PASS	
		BP?	Response: BP 0 to BP 2	
	Power frequency	LF?	Response: 50 Hz 60 Hz	
	Device initialization	*RST	Parameter initialization	
		CDV	Device clear	
	Equipment information	*IDN?	Response: ADC Corp., 7470, nnnnnnnnn, mmm nnnnnnnnn: Serial No. mmm: Revision No.	
	output data· element	DFEn	Specify information to be added to output data by bit value bit 9 7 6 5 3 2 0 :unused Output function (1) Output comparator result (4) Output 4W check result (8) Output NULL function ON / OFF (32) Output smoothing function ON / OFF (64) Output calculation calculation state (128) Output MAX / MIN operation state (512) Multiple items can be set corresponding to bits Example) When outputting function and NULL function ON / OFF DFE 33	(0)
		DFE?	Response: DFEddddd	
	block· delimiter	DL 0	CR / LF + EOI	●
		DL 1	LF	
		DL 2	EOI	
		DL?	Response: DL 0 to DL 2	

	item	command	Contents	initial value
system	status	* CLS	Clear each status byte	
		* STB?	Reading the status byte register Response: ddd	
		* SREn	Setting of service request enable register (SRER) n: 0 to 255 (However, bit 6 can not be set)	
		* SRE?	Response: ddd	
		* ESR?	Reading the standard event status register (SESR) Finding out Response: ddd	
		* ESEn	Standard event status enable register Setting of SESER n: 0 to 255	
		* ESE?	Response: ddd	
		OSR?	Read operation event register (OER) Response: ddddd	
		OSEn	Operation event enable register (OEER) setting n: 0 to 65535	
		OSE?	Response: ddddd	
		MSR?	Reading the measurement event register Response: ddddd	
		MSEn	Measurement event enable register (MSE) Configuration n: 0 to 65535	(0)
		MSE?	Response: ddddd	
		QSR?	Read out of the quasiable event register Response: ddddd	
		QSEn	Queryable event enable register (MSE) settings of n: 0 to 65535	(0)
		QSE?	Response: ddddd	
		* PSCn	n: 0 to ± 32767 When n is other than 0, the following register is cleared at power on I will. · Service request · Enable · Register · Standard · Event Status · Enable · Disaster When 0 is set, when the power supply is turned on, the above register It will not be cleared.	(1)
		* PSC?	Response: 0 or 1 (when a value other than 0 is set)	

	item	command	Contents	initial value
system	Error queue	ERR?	Read out error content Response: ± ddd, "xxxxxxxxxx" Error string (max 80 characters) Error code	

		· Up to 20 error contents are saved. Error is FIFO It is output by the method. · If more than 20 errors occurred, the last saved error Is overwritten with -350, "Queue overflow". - If there is no error, + 0, "No error" is responded.
Measurement data display	DS0	OFF
	DS1	ON
	DS?	Response: DS0 or DS1
operation· complete	* OPC	After completing all operations Standard event status register Set "Operation complete" bit (bit 0).
	* OPC?	Response: 1 (after completion of all operations)
	* WAI	Wait for completion of all operations (GPIB only)
Self test	* TST?	Execution and reading results (Execution time is required. Please read the result after the execution is finished. .) response: 0: Pass 1: Fail

item		command	Contents	initial value
system	Proofreading	CAL 0	Turn off the calibration mode (Write calibration coefficient when exiting calibration.)	●
		CAL 1	Turn on the calibration mode	
		CAL?	Response: CAL 0 or CAL 1	
		CALZF	External ZERO calibration (FRONT input) execution?	
		CALZR	External ZERO calibration (REAR input) execution?	
		CALDCn	DCV External calibration execution? n: 9.00000000 to 11.0000000 [V]	
		CALOHn	OHM External calibration execution? n: 9000.00000 to 11000.0000 [Ω]	
		ICAL	DCV, OHM internal calibration execution	
		ICALDC	DCV internal calibration execution	
		ICALDCT?	Read the internal temperature when performing DCV internal calibration Response: ± d.ddddddddE ± dd	
		ICALOH	OHM Internal calibration execution	
		ICALOHT?	OHM reading internal temperature during internal calibration Response: ± d.ddddddddE ± dd	
Configuration parameters		* SAVn	Save setting parameter to area [n] of nonvolatile memory n: 0 to 3	
		SINI	Set factory default value for all areas [0] to [3]	
		* RCLn	Load setting parameter of area [n] of nonvolatile memory	

		n: 0 to 3
	RINI	Load factory default value as setting parameter
Input terminal	IN 0	front
	IN 1	rear
	IN?	Response: IN 0 or IN 1
GUARD setting	LGU 0	FLOAT
	LGU 1	LOW
	LGU?	Response: LGU 0 or LGU 1
Internal temperature measurement	TIN?	Response: ± dd.dE + dd

?: If it is not in the calibration mode, an error occurs.

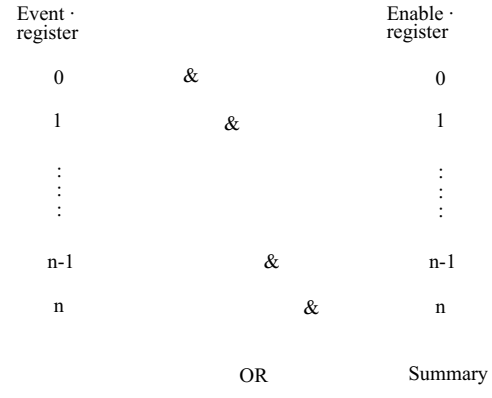
6.5.3 **SCPI** Command Reference

The SCPI command can not be used with this instrument.

6.5.4 Status register structure

This instrument has a hierarchical status register structure conforming to the IEEE Standard 488.2-1987,
Various states of the instrument can be sent to the controller. Here, the behavior model of this status structure and
Explain the assignment of events.

The status register consists of an event register and an enable register.



- Event register

  The event register latches and holds the status corresponding to each event. Strange
  It may sometimes hold.)
  When this register is set, it is read out by the query or cleared by * CLS.
  It remains set in.
  Data can not be written to the event register.

- Enable register

  The enable register sets any bit of the event register to a valid status
  Specify whether to generate a summary. The enable register consists of an event register
  AND is taken and OR of the result is generated as a summary. Summary status ·
  It is written to the byte register.
  Enable registers can write data.

There are five types of status registers of this product as follows.

- Status byte register (STB)
- Standard event status register (SESR)
- Operation event register (OER)
- Queryable event register (QSR)
- Measurement event register (MER)

1. Status Byte Register (STB)

Table 6-5 Status Byte Register

bit	name	Contents
0	MSB (Measurement Summary Bit)	One of events of ON: Measurement Event Register occurs and becomes 1 , The corresponding bit of Measurement Event Enable Register is 1 If so, this bit is set to 1
		OFF: When the Measurement Event Register is cleared by reading, It is set to 0
1	unused	Always 0
2	EAV (Error Available)	ON: Set to 1 when error information is stored in Error Queue OFF: Set to 0 when the Error Queue is read and becomes empty
3	QSB (Questionable Summary Bit)	Either event of ON: Questionable Event Register occurs and becomes 1 , The corresponding bit of the Questionable Event Enable Register is 1 If so, this bit is set to 1
		OFF: When the Questionable Event Register is cleared by reading, It is set to 0
4	MAV (Message Available)	ON: Set to 1 when output data is input to the output buffer OFF: Set to 0 when the output buffer is read and empty
5	ESB (Standard Event Status)	When one of the events of ON: SESR occurs, when it becomes 1, a pair of SESER If the corresponding bit is 1, this bit is set to 1
		OFF: Set to 0 when SESR is cleared by reading (* ESR?) To be
6	MSS (Master Summary)	ON: When any event of the STB occurs, the corresponding bit of SRER becomes 1 If this bit is set to 1
	RQS (Request Service)	ON: When MSS becomes 1, SRQ is generated and RQS becomes 1. OFF: STB is read out with serial poll
7	OSB (Operation Summary Bit)	One of events of ON: Operation Event Register occurred and it became 1 , When the corresponding bit of the Operation Event Enable Register is 1 This bit is set to 1
		OFF: When the Operation Event Register is cleared by reading, 0 に設定される

• Status Byte Register がクリアされる共通条件
電源投入ですべてクリア
"*CLS" ですべてクリア、ただし出力バッファにデータがある場合、MAV ビットはクリアしない
"*STB?" で読み出してもクリアされない
• Service Request Enable Register がクリアされる条件
電源投入時（PSC フラグが 1 のとき）
"*SRE0" コマンドを実行したとき

本器のステータス・レジスタの構造を図6-3に示します。

図 6-3 ステータス・バイト構造

2. スタンダード・イベント・ステータス・レジスタ (SESR)

表 6-6 スタンダード・イベント・ステータス・レジスタ

bit	name	Contents
0	OPC (Operation Complete)	ON: *OPC コマンド受信後、実行中の全動作が終了すると 1 に設定される
1	未使用	常に 0
2	未使用	常に 0
3	DDE (Device Dependent Error)	ON: 機器依存のエラーが発生したとき、1 に設定される
4	EXE (Execution Error)	ON: 受信したコマンドが現在実行不可能なとき、1 に設定される
5	CME (Command Error)	ON: 受信したコマンドのつづりが間違っていたとき、1 に設定される
6	MSS (Master Summary)	常に 0
7	PON (Power On)	ON: 電源 OFF→ON 時、1 に設定される

- スタンダード・イベント・ステータス・レジスタがクリアされる共通条件
  電源投入ですべてクリア
  *CLS ですべてクリア
  *ESR? で読み出すことによりすべてクリアされる
- スタンダード・イベント・ステータス・イネーブル・レジスタがクリアされる条件
  電源投入時（PSC フラグが 1 のとき）
  "*ESE0" コマンドを実行したとき

3. メジャーメント・イベント・レジスタ

表 6-7 メジャーメント・イベント・レジスタ

bit	name	Contents
0	FL (FAIL)	ON: 比較演算結果が FAIL 条件のとき、1 に設定される
1	PS (PASS)	ON: 比較演算結果が PASS 条件と一致したとき、1 に設定される
2	未使用	常に 0
3	未使用	常に 0
4	OK (4W Ohm check OK)	4WΩ チェック結果が OK のとき、1 に設定される
5	NG (4W Ohm check NG)	4WΩ チェック結果が NG のとき、1 に設定される
6	未使用	常に 0
7	未使用	常に 0
8	EOM (End of measure)	ON: 測定が終了したとき、1 に設定される
9	EOS (End of store)	ON: 測定データをこれ以上測定メモリに格納できなくなったとき、1 に設定される
10	SM (Smoothing)	ON: スムージング回数が指定数に達したとき、1 に設定される
11	STAT (Statistics)	ON: 統計処理が終了したとき、1 に設定される
12	未使用	常に 0
13	未使用	常に 0
14	未使用	常に 0
15	未使用	常に 0

- メジャーメント・イベント・レジスタがクリアされる共通条件
  電源投入ですべてクリア
  "*CLS" コマンド入力
  "MSR?" コマンドで読み出したとき
- メジャーメント・イベント・イネーブル・レジスタがクリアされる条件
  電源投入ですべてクリア
  "MSE0" コマンドを実行したとき

4. オペレーション・イベント・レジスタ

表 6-8 オペレーション・イベント・レジスタ

bit	name	Contents
0	Calibrating	CAL が終了したとき、1 に設定される
1	未使用	常に 0
2	未使用	常に 0
3	未使用	常に 0
Four	未使用	常に 0
5	Waiting for TRIG	ON: Trigger Layer に入ったとき、1 に設定される
6	未使用	常に 0
7	未使用	常に 0
8	未使用	常に 0
9	Idle	ON: アイドル状態になったとき、1 に設定される
10	未使用	常に 0
11	未使用	常に 0
12	未使用	常に 0
13	未使用	常に 0
14	未使用	常に 0
15	未使用	常に 0

- オペレーション・イベント・レジスタがクリアされる共通条件
  電源投入ですべてクリア
  "*CLS" コマンド入力
- オペレーション・イベント・イネーブル・レジスタがクリアされる条件
  電源投入ですべてクリア
  "MSE0" コマンドを実行したとき

5. クエスチョナブル・イベント・レジスタ

表 6-9 クエスチョナブル・イベント・レジスタ

bit	name	Contents
0	Voltage Overload	ON: 電圧測定で OL が発生したとき、1 に設定される
1	未使用	常に 0
2	未使用	常に 0
3	未使用	常に 0
Four	未使用	常に 0
5	Waiting for TRIG	常に 0
6	未使用	常に 0
7	未使用	常に 0
8	Summary of Calibration	ON: 電源 ON 時のチェックで校正データ SUM 異常により、デフォルト校正値、または前回電源 ON 時の校正値を使用する場合、1 に設定される
9	Ohms Overload	ON: 抵抗測定で OL が発生したとき、1 に設定される
10	未使用	常に 0
11	未使用	常に 0
12	Alarm	ON: 測定でアラームが発生したとき、1 に設定される
13	未使用	常に 0
14		
15	未使用	常に 0

- クエスチョナブル・イベント・レジスタがクリアされる共通条件
  電源投入ですべてクリア
  "*CLS" コマンド入力
  "QSR?" コマンドで読み出したとき
- クエスチョナブル・イベント・イネーブル・レジスタがクリアされる条件
  電源投入ですべてクリア
  "QSE0" コマンドを実行したとき

6.6サンプル・プログラム

ここでは、GPIB を使用して本器をパーソナル・コンピュータから操作する基本的なプログラム例を説明します。

【動作確認環境】

パーソナル・コンピュータ：
富士通株式会社製 FMV-5350ML3 (OS:Windows98)

GPIB ハードウェア： NATIONAL INSTRUMENTS 社製 PCI-GPIB

モジュール： Niglobal.bas,Vbib-32.bas（PCI-GPIB に付属のソフトウェア）

言語： Microsoft Excel Visual Basic Application

例 1 直流電圧 10V レンジで測定し、その測定データを 7470 から読み込みます。
7470 の GPIB アドレスは 1 に設定してあります。

```
Dim DMM_ADR As Integer              '7470 の GPIB アドレス変数を宣言する
Dim dmm As Integer                  ' デバイス・ディスクリプタの変数を宣言する
Dim dt As String * 100              ' GPIB データ受信用バッファの変数を宣言する

DMM_ADR = 1                         '7470 の GPIB アドレス

Call ibdev(0, DMM_ADR, 0, T10s, 1, 0, dmm)
                                    ' GPIB I/F の初期化を行う
Call ibconfig(dmm, IbcUnAddr, 1)    ' 送受信ごとのアドレス設定を行う
Call ibwrt(dmm, "*RST" & Chr(10))   '7470 の初期化を行う

Call ibwrt(dmm, "DFE1" & Chr(10))   ' 出力データのヘッダを ON にする
Call ibwrt(dmm, "F1" & Chr(10))     ' 測定ファンクションを DCV に設定する
Call ibwrt(dmm, "R5" & Chr(10))     ' 測定レンジを 10V に設定する
Call ibwrt(dmm, "PR3" & Chr(10))    ' サンプリング・レートを SLOW に設定する

Call ibrd(dmm, dt)                  ' 測定値を変数に代入する

Cells(1, 1) = Left(dt, 17)          ' 測定値をセルに代入する

Call ibonl(dmm, 0)                  ' 終了する
```


例 2 測定ファンクションを 2 線式抵抗測定に設定し、ステータス・バイトにより測定終了を
検出し、測定データを 7470 から読み込みます。
7470 の GPIB アドレスは 1 に設定してあります。

```
Dim DMM_ADR As Integer              ' 7470 の GPIB アドレス変数を宣言する
Dim dmm As Integer                  ' デバイス・ディスクリプタの変数を宣言する
Dim dt As String * 100              ' GPIB データ受信用バッファの変数を宣言する

DMM_ADR = 1                         ' 7470 の GPIB アドレス

Call ibdev(0, DMM_ADR, 0, T10s, 1, 0, dmm)
                                    ' GPIB I/F の初期化を行う
Call ibconfig(dmm, IbcUnAddr, 1)    ' 送受信ごとのアドレス設定を行う
Call ibwrt(dmm, "*RST" & Chr(10))   ' 7470 の初期化を行う

Call ibwrt(dmm, "DFE1" & Chr(10))   ' 出力データのヘッダを ON にする
Call ibwrt(dmm, "F3" & Chr(10))     ' 測定ファンクションを 2WΩ に設定する
Call ibwrt(dmm, "R4" & Chr(10))     ' 測定レンジを 1kΩ に設定する
Call ibwrt(dmm, "ITP1" & Chr(10))   ' 積分時間を 1PLC に設定する
Call ibwrt(dmm, "TRS3" & Chr(10))   ' トリガをバスにする
Call ibwrt(dmm, "*CLS" & Chr(10))   ' ステータス・バイトをクリアする

Call ibwrt(dmm, "*TRG" & Chr(10))   ' トリガをかける

Do                                  ' 測定終了のステータス・バイトを読み込む
  Call ibwrt(dmm, "*STB?" & Chr(10))
                                    ' ステータス・バイトの内容を要求する
  Call ibrd(dmm, dt)                ' 変数 dt の中にステータス・バイトの内容を入れる
  dt = dt And 16                    ' bit4(MAV) で論理積をとる
Loop While (dt <> 16)

Call ibrd(dmm, dt)                  ' 測定データを読む

Cells(1, 1) = Left(dt, 17)          ' 測定値をセルに代入する

Call ibonl(dmm, 0)                  ' 終了する
```